S9 Antennas

# Model S9v

## 31’ Multiband Vertical Antenna

## *Installation Guide*

**WARNING: INSTALLATION OF THIS PRODUCT NEAR POWERLINES IS DANGEROUS. FOR YOUR SAFETY, FOLLOW THE INSTALLATION DIRECTIONS.**

# INTRODUCTION

Thank you for purchasing the S9v. The S9v is a tapered, ultra-lightweight 31' vertical antenna designed for portable and fixed Amateur Radio use from 40 through 6 meters. We believe the S9v to be the lightest, most efficient and safest full-size vertical antenna available. Whether you're at home or in the field, we sincerely hope that you enjoy your S9v.

Please read this guide in its entirety FIRST before installing your S9v. The S9v is extremely easy to install and deploy, but reading through this guide first will make it a painless and enjoyable experience.

# BEFORE YOU GET STARTED…

The S9v is shipped assembled with all the components and hardware you need to install the antenna. You will need to furnish a Phillips head screwdriver, coax cable, an antenna tuner, a balun/unun, a pipe or mast for the ground or roof mount, some radials, and weatherproofing material.

## Coax Cable

For top performance, the S9v should be fed with a quality, low-loss 50-ohm coaxial feed line such as RG-213 or LMR400. RG-8x is perfectly adequate for short runs of 50 feet or less.

## Configurations

When used with a proper ground system, the S9v is a serious 40 meter DX antenna.

The natural resonant frequency of the S9v is just above the top of the 40 meter band - around 7.4 MHz - and it is extremely broad-banded. Depending on your RF ground system and proximity to nearby objects, the S9v may exhibit an SWR well below 2:1 in the upper, SSB portion of the 40 meter band without an antenna tuner.

So, if you operate a lot of SSB on 40, you may be able to use the S9v on 40 meters without using an antenna tuner. In this configuration, the coax feed line can be directly connected to the S9v. Radials and a 1:1 choke balun are strongly recommended, however. As a 40 meter monoband antenna, the S9v can be mounted on the ground or as an elevated ground plane antenna on a pole, your roof or a tower.

If you want to use the S9v as a 40 meter monoband vertical in the lower, CW portion of the band and do not own (or want to use) an antenna tuner, consider our optional 40 meter monoband conversion kit – please see our web site for details. The monoband conversion kit is also useful if you want to phase two S9v antennas on 40 meters for 3 to 4 dB of directional gain over a dipole.

## Antenna Tuner

Internal rig tuners will easily tune the S9v anywhere on 40 meters. But if you want to use the S9v as a multi-band antenna, you will need a quality antenna tuner in your shack or remotely located at the antenna feed point. (Internal rig tuners do not have adequate range to match the higher impedances presented by the antenna on bands above 40 meters.) For multi-band use, we recommend the LDG Electronics series of auto tuners for use with the S9v. LDG tuners easily handle the wide-range of impedances presented by the S9v over the higher HF frequencies and also cover 6 meters.

Using a weatherproofed, remote antenna tuner at the antenna feed point ensures absolute lowest signal loss and best overall multi-band performance. There are several remote antenna tuners on the market. Some of these remote tuners include u-bolts allowing them to be mounted directly onto the S9v base tube.

When a remote tuner is used at the S9v feedpoint, a 4:1 unun is not required. A 1:1 current choke balun may be required between the tuner and your transmitter if you experience RF current in your shack. (Burying your coax cable also helps minimize RF current from flowing back into your shack.)

## Balun/Unun

For 40 meter monoband use, a 1:1 current choke balun should be located as close as possible to the antenna feed point to isolate RF currents from flowing back into your shack over the coax shield. There are several commercially-available 1:1 choke baluns (Balun Designs offers some of the best – see them at www.balundesigns.com) or you can create a simple choke balun using your coax feed line.

To create a 1:1 choke balun using your coax feed line, simply wind the last 18 to 21 feet of your coax feed line before the antenna evenly around a 4-inch round form such as a PVC pipe. You can use zip lock cable ties to secure the windings and to maintain the coil form. Additional information about constructing an inexpensive 1:1 choke balun using your coax feedline can be found on-line at: http://www.hamuniverse.com/balun.html.

**For multi-band use and coax runs over 50 feet long**, a 4:1 "unun" from Balun Designs is recommended at the antenna feed point. A 4:1 unun lowers the higher impedances presented by the S9v on frequencies above 40 meters.

Balun Designs manufactures two 4:1 ununs specifically for the S9v, depending on the amount of power you expect to run. These ununs may be purchased on-line at www.balundesigns.com:

- If you are running 300 watts or less, use the Balun Designs "Model 4130sv for S9 Vertical".

- If you are running more than 300 watts, use the Balun Designs "4:1 Unun for Verticals" (Model # 4134).

**For multi-band use and short coax runs (50 feet or less)**, a quality antenna tuner and a 1:1 current choke balun at the antenna feed point will suffice.

In a multi-band configuration, expect excellent results on 40 through 17 meters and very good results on 15 through 10 meters. If your tuner covers 6 meters, your S9v will allow you to make local contacts and DX contacts during Sporadic E openings.

## Ground or Elevated Mount

A pipe or mast is required for the S9v to be mounted on the ground or in the air.

**For standard ground-mount installations**, use a 40-inch long (minimum recommended length), 1-1/4" (1-5/8"OD MAXIMUM) galvanized pipe. You can also use our optional Portable Mount for permanent or temporary installations. Hardware stores such as Home Depot™ and Lowes™ stock 1-1/4" galvanized pipe in their plumbing departments and this type of pipe is ideal for the ground mount. Most hardware stores also have a pipe cutting machine and they will cut your pipe to 40 inches upon request.

The S9v base tube simply slips over the 1-1/4" pipe (or our Portable Mount) and rests on the ground for an easy and elegant deployment. (A mechanical connection from the antenna base tube to the ground mount is neither required nor desired.) Do NOT use a pipe with an OD larger than 1-5/8" or it will be impossible to slip the S9v base tube over the pipe.

The optional S9v Pipe Mount Clamp, shown below, lets you raise the S9v base off of the ground for a professional installation.

S9v Pipe Mount Clamp

**For portable ground-mount operations and DXpeditions**, use our optional Portable Mount, shown below. The Portable Mount is a heavy-duty mount with an integral stake that makes ground mounting the S9v in temporary (or permanent) locations fast and easy.

S9v Portable Mount

**For elevated installations,** you have several options. Because the S9v is so light, you can roof-mount the antenna using a simple TV-type tripod from Radio Shack™ or any electronics store. We suggest using a 3 to 4 foot fiberglass mast. Again, do not use a mast with an OD larger than 1-5/8". To create a mount for the S9v on the mast, simply install the optional S9v Pipe Mount Clamp 15" from the top of the mast. The S9v will slip over the mast and rest on the flat portion of the clamp assembly. In this elevated configuration, the S9v functions as a ground plane (GP) antenna and only 4 radials are required, as discussed below.

## Radials

For optimum performance, the S9v should be used with an RF ground system consisting of radial wires.

**For ground-mounted installations**, use at least 16 radials (32 preferred), with each radial at least 0.2 wavelength at the lowest operating frequency (7 MHz) which is 26.75 feet (26 feet, 9 inches long). A ground rod is not an effective RF ground.

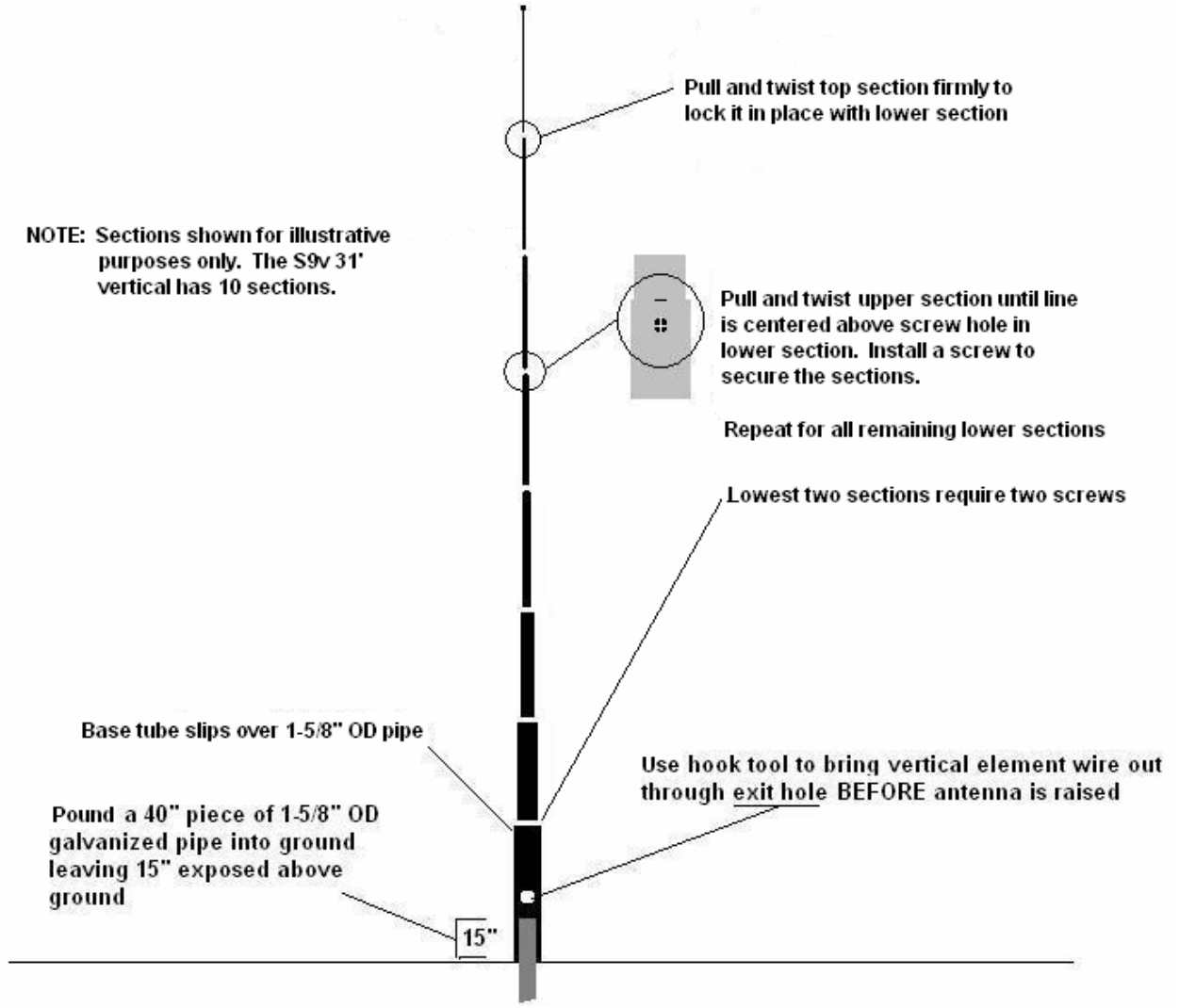
There is no precise formula to calculate the length of ground-mounted radials because everyone has different soil and soil tends to change the electrical length of the radials. However, a general rule of thumb for radials is: "longer" and "more" and "some" are better than "none". If you have the time and resources, 32 or more radials at least 26 feet, 9 inches in length (or longer) should be considered.

It is highly recommend that you use ring terminal connectors and a radial plate to connect and organize your radials. The optional S9 Radial Plate (or our PRO plate) has 36 radial mounting holes and includes 20 sets of stainless steel hardware – enough to connect 40 radials to the plate. Additional, detailed information on ground-mounted radials can be found on page 19.

S9 Radial Plate

**For elevated installations**, use 4 radials, each ¼ wavelength at 7 MHz (33 feet, 5 inches long). Simply attach the 4 radials to the optional S9v Pipe Mount Clamp below the base of the antenna and try to position the 4 radials equidistantly around the S9v base. If possible, drop the radials away from the S9v at a 45-degree angle to the base. Attach insulators to the ends of the radials. Connect your coax shield to the clamp and radials. Do NOT run a wire from the radials/clamp/coax shield to an earth ground.

# INSTALLATION – QUICK REFERENCE


Pull and twist top section firmly to lock it in place with lower section
NOTE: Sections shown for illustrative purposes only. The S9v 31' vertical has 10 sections.
Pull and twist upper section until line is centered above screw hole in lower section. Install a screw to secure the sections.
Repeat for all remaining lower sections
Lowest two sections require two screws
Base tube slips over 1-5/8" OD pipe
Use hook tool to bring vertical element wire out through exit hole BEFORE antenna is raised
Pound a 40" piece of 1-5/8" OD galvanized pipe into ground leaving 15" exposed above ground
15"

# INSTALLATION – DETAILED INSTRUCTIONS

1. **Select the Site**. Try to use a clear and open area to deploy the S9v. Even though the S9v is completely insulated, you absolutely MUST locate the antenna site at least 46' away from power lines (1.5x the length of the antenna). In fact, an ideal installation site would be a least 46' away from *any* other large object such as a house or trees.

2. **Install the Mount**. The S9v requires a mount. The elevated mount was discussed earlier. For ground-mount installations, you will need a large hammer, a spare piece of wood and a level.

**IMPORTANT!**

***Place a piece of wood over the top of the pipe or Portable Mount to protect the top edges from becoming deformed. Hammer the piece of wood in a straight downward direction. Do NOT directly hammer the pipe or Portable Mount metal – hammer the wood to protect the pipe/mount.***

**NOTE: Use a level while you are installing the pipe or Portable Mount to ensure that it is as straight as possible in the vertical plane.**

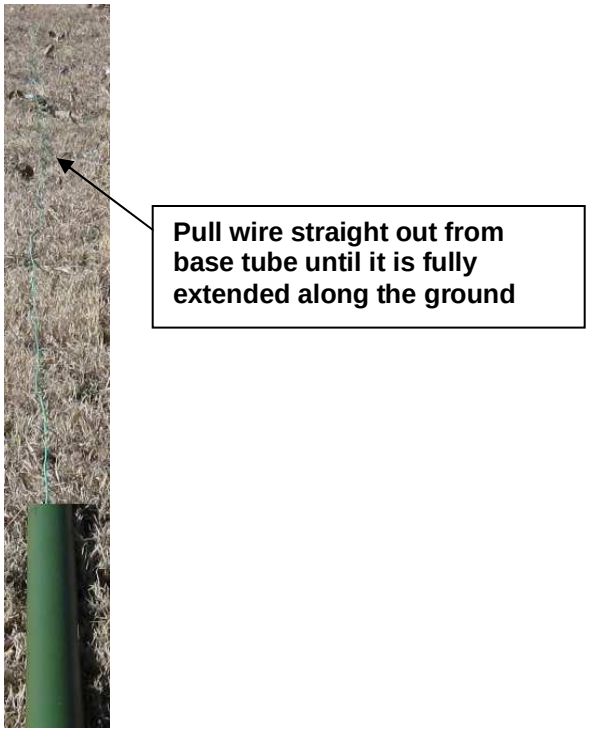
Drive the 1-1/4" (1-5/8" OD MAX) x 40-inch long pipe into the ground leaving 15 INCHES MAXIMUM above the ground. If you have purchased the optional S9v Pipe Mount Clamp, bolt it to the pipe an inch or two above the ground.

If you are using the optional Portable Mount, drive the stake into the ground until the bottom of the mount is flush with the ground.

3. **Install the Radial Plate**. After you have installed the pipe or Portable Mount, install the radial plate. (The S9 Radial Plate simply slips over the pipe or Portable Mount.)

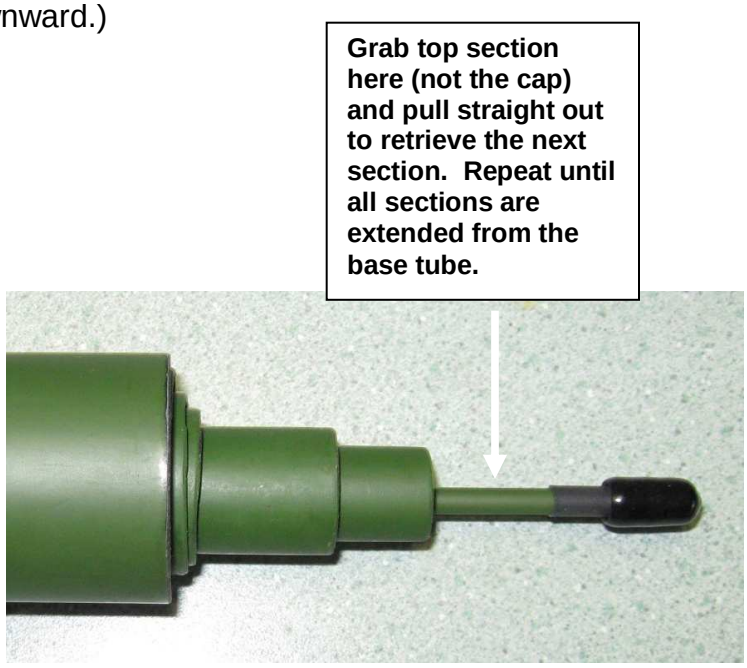
4. **Assemble the S9v**. To assemble the S9v antenna:

   a. Lay the S9v on the ground near the ground mount and unwind the vertical element wire from the base tube. Now, "walk the wire" away from the antenna base tube in a straight line. Don't pull unnecessarily on the wire – the idea is to just un-roll the wire to its full length. Once the wire is completely unrolled, pull small sections of the wire through your hands to straighten the wire. **NOTE: The wire does NOT have to be perfectly straight, so don't spend a lot of time trying to straighten the wire!**




   b. Next, remove the TOP end cap. Do NOT remove the BOTTOM end cap where the wire exits. Put the top cap in your pocket so that it will not be lost in the grass.

c. Now we are ready to extend the antenna sections. The S9v should still be laying flat on the ground. To extend the antenna, grab a section of the wire near the bottom end cap and push the wire into the base tube. This action should cause the top, thinnest section of the antenna (it has a cap on its tip) to pop out of the top of the base tube. (If this doesn't work, pick-up the base tube and shake it slightly while pointing the top part of the tube downward.)


**Grab top section here (not the cap) and pull straight out to retrieve the next section. Repeat until all sections are extended from the base tube.**

d. Gently pull the top, thinnest section straight out of the base tube (pull the section, not the cap) until it catches and pulls the next, lower section out. Gently twist the top section to lock it into the lower section. Now, pull the lower section straight out until the next section appears. Gently twist and lock the sections. Repeat this until you have extended all the sections from the base tube.

**NOTE: When the antenna is completely extended on the ground the vertical element wire may disappear into the base tube - we will retrieve it in a few steps.**

e. All of the sections (except the top section) have been pre-drilled to accept a stainless steel screw (9 needed; 10 provided). Starting at the bottom of the antenna, grasp the base tube in one hand and twist and pull the section above the base tube until you see a small black mark on the upper section (the mark should appear above the seam between the two sections). Twist the upper tube until the mark on the upper section aligns with the pre-drilled screw hole in the lower base tube. At this point, the pre-drilled holes in both sections should be aligned. For example:

f. Using a Phillips screwdriver, install TWO screws in the base tube (one on each side). DO NOT OVER-TIGHTEN the screws. It is not necessary to make the screws extremely tight.

g. Install screws in the remaining fiberglass sections, working your way up the antenna. (The base tube is the only section that requires two screws.)

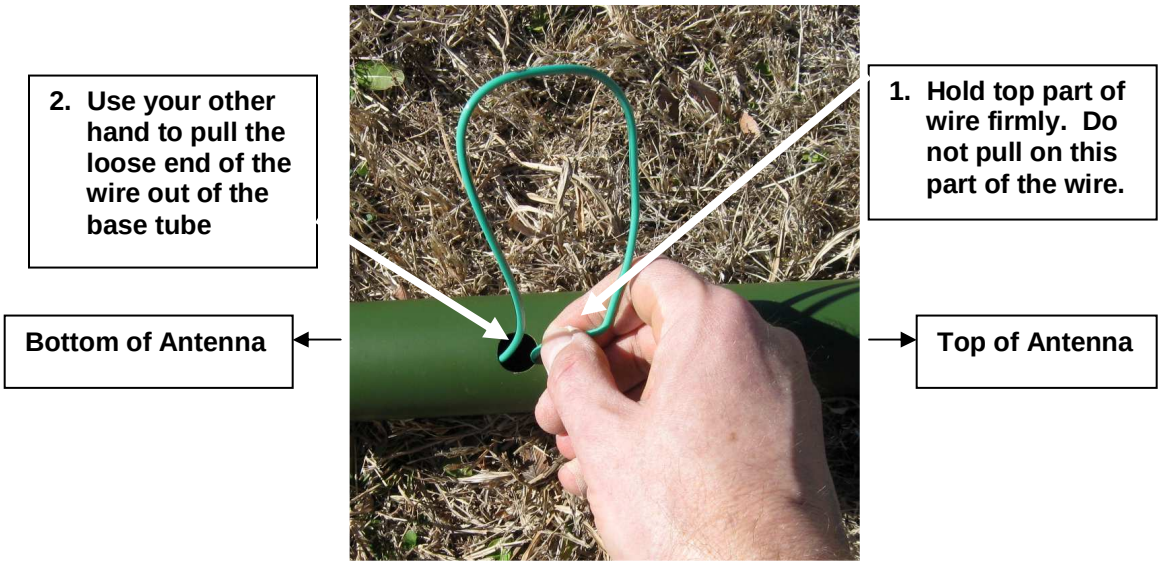
h. The top section does not require a screw. To secure the top section, hold the section below it with one hand and firmly twist and pull the top section out with your other hand until it is firmly locked in place.

**NOTE: The antenna should now be fully extended and laying on the ground and all sections (except the top section) should be secured with the screws.**

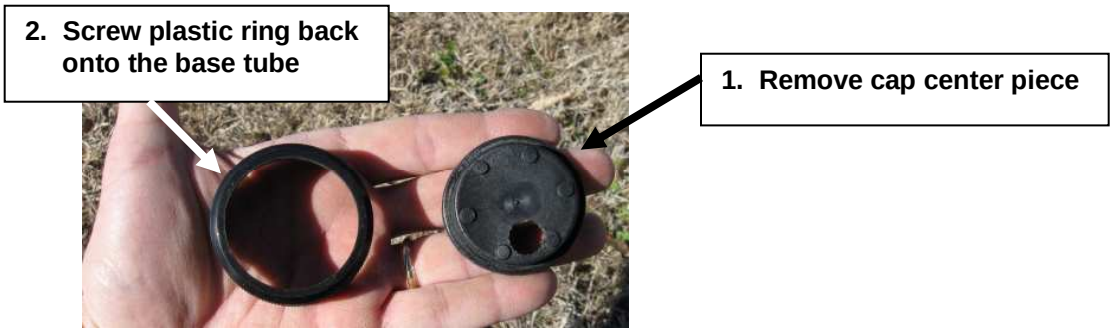
i. Now, let's retrieve the vertical element wire from the base tube. Rotate the base tube until you see the wire exit hole – it is located on the opposite side of the tube from the wire tabs.

j. Use the supplied hook tool to grab the wire and pull a small U-shaped portion of the wire through the exit hole, as shown below.

Once you get a small U-shaped portion of the wire out of the exit hole, you can twist the tool, if needed, to help retrieve the wire. Now STOP and carefully remove the tool. Next, hold the top part of the wire firmly in one hand while you use your other hand to pull the lower, loose end of the wire out through the exit hole. Do not pull on the top part of the wire – just pull on the lower, loose end!


2. Use your other hand to pull the loose end of the wire out of the base tube
1. Hold top part of wire firmly. Do not pull on this part of the wire.
Bottom of Antenna
Top of Antenna

k. Before we raise the antenna, unscrew the bottom end cap. This cap consists of a center piece and plastic ring. Remove the center piece and put it in your pocket.



l. Now, screw the plastic ring back onto the base tube. The ring will protect the base tube bottom cap threads while the antenna is deployed and it also creates a drain path for any condensation that accumulates inside the fiberglass sections.

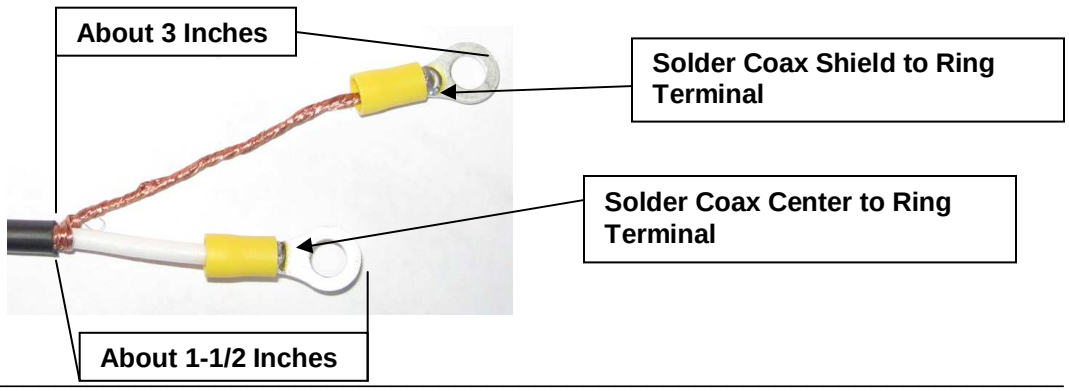
5. **Raise the S9v**. This is the fun part! To raise the S9v, simply grab the base tube with one hand and the next section with your other hand and raise the antenna. Next, center the antenna directly over the pipe or Portable Mount and then gently lower the S9v down until the bottom of the base tube rests on the ground or the optional pipe mount clamp.

6. **Connect Coax Feed Line to Antenna**.

If you are using the S9v as a 40 meter monoband vertical, proceed with step "a", below.

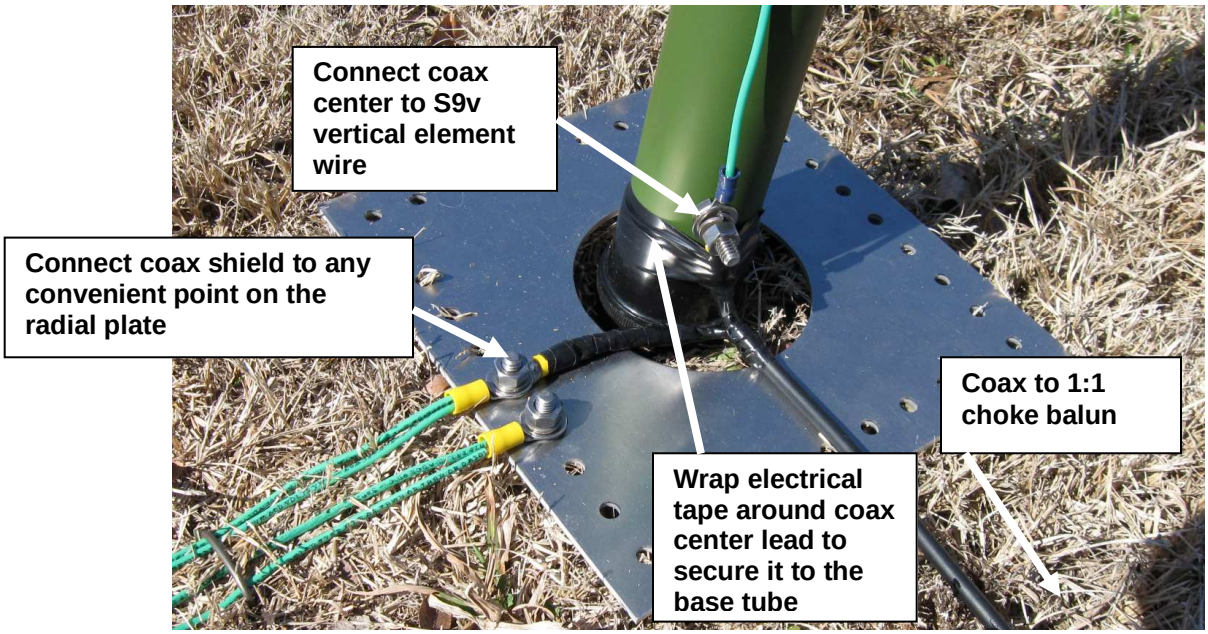
If you are using the S9v as a multi-band antenna (40 – 6 meters), skip to step "b" on page 19 now.

a. **If you are using the S9v as a 40 meter monoband vertical**, position the 1:1 choke balun as close as possible to the S9v base. Then, solder the two supplied ring terminal connectors to the end of your coax feed line. (If you are using a commercial 1:1 choke balun, this would be the 'antenna end' of the short length of coax you run from the balun to the S9v.) To prepare the coax, remove about 3 inches of the coax outer jacket. Leave the braid 3 inches long and trim back the center connection to around 1-1/2 inches long. Then, solder the center and shield coax connections to the ring terminals.



Refer to the picture below. Wrap some electrical tape around the coax center and shield. Then, using the supplied stainless steel hardware, connect the coax center connector to the S9v vertical element wire. (The bolt head should face the base tube, as shown below.) Secure the coax center lead to the bottom of the base tube with electrical tape.

Next, connect the coax shield to a convenient hole on the radial plate. Now, skip to step "c" on page 19.


Connect coax center to S9v vertical element wire
Connect coax shield to any convenient point on the radial plate
Coax to 1:1 choke balun
Wrap electrical tape around coax center lead to secure it to the base tube

b. **<u>If you are using the S9v as a multi-band vertical</u>**, position the 4:1 unun (or remote antenna tuner) at the base of the S9v and connect the S9v vertical element wire ring terminal connector to the unun stud marked **Vertical** (or to the remote antenna tuner connector marked **Antenna**).

Next, solder two ring terminal connectors to a short piece of radial wire or copper braid and connect the unun **Radials** stud (or remote antenna tuner **Ground** connector) to the nearest hole on the radial plate. Finally, connect your coax feed line PL-259 male connector to the 4:1 unun (or remote antenna tuner) SO-239 female connector.

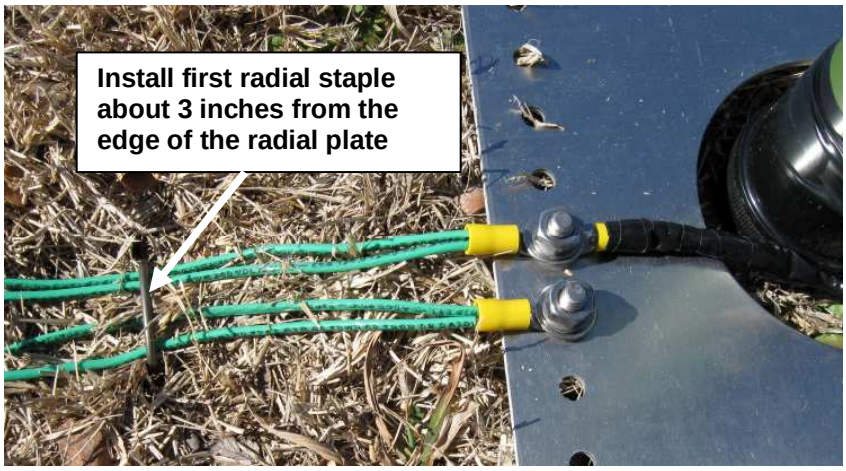
c. You should use electrical tape to secure the vertical element wire below the base tube exit hole. If there is any slack in the vertical element wire, it should to be left ABOVE the electrical tape. This way, there will be some slack wire available to move with the fiberglass sections in the event of very strong wind.

d. COMPLETELY weatherproof the vertical element wire connection and all coax feed line and unun connections using the sealant of your choice such as coax seal, silicon RTV, etc.

**NOTE: It is <u>not</u> necessary to weatherproof the ring terminal connections on the radial plate.**

7. **Install Ground Radials**. For ground-mount installations, we suggest a minimum of 16 radials, each at least 26 feet, 9 inches long spaced as evenly as possible around the S9v base – like wheel spokes. For best performance, use 32 (or more) radials. It is suggested that you use 14 AWG insulated stranded copper wire (available at Home Depot™ and sold in 500-ft rolls for around $35). S9 sells ring terminal connectors to facilitate connecting the radial wires to the radial plate.

   Use lawn and garden fabric staples (sold at Home Depot™ or Lowes™) to secure the radials to your yard. Install the first staple about 3 inches or so from the edge of the radial plate. Grass will eventually grow over the radials and cover them. In the meantime, be sure to set your lawn mower blade a little higher than normal to ensure that the radials do not get caught in the mower blade - this advice comes from real-world "experience" (!). It is best to use *at least* 8 staples per radial to ensure the radials are held firmly against the ground.



# LOWERING THE S9v

The antenna should perform in winds up to around 40 MPH. Ice is definitely a concern for any antenna. If winds above 40 MPH and/or ice are expected, you should lower the antenna to protect it from becoming damaged.

To lower the S9v, simply disconnect the vertical element wire from the coax center connection (or unun/remote antenna tuner) and carefully lift the antenna straight up off of the ground mount pipe. Then, gently lower the antenna to the ground.

**NOTE: If the wind is strong, it is easier to lower the antenna with the wind at your back.**

If your S9v becomes damaged, replacement fiberglass sections are available from S9 at reasonable cost.

# DISASSEMBLING THE S9v

To disassemble the S9v:

1. Disconnect the vertical element wire from the coax center connection or unun.

2. Carefully lift the antenna off of the ground mount and gently lower it to the ground.

3. Remove the bottom end cap ring from the base tube and insert the center piece back into the ring – we will put this cap back on in a few steps, so hold onto it for now.

4. Carefully bend and push the connector end of the vertical element wire back through the exit hole and into the base tube.

5. Remove ALL screws from the fiberglass sections and put them in a zip lock bag for future use.

6. Now, collapse the antenna sections. Hold the base tube firmly in one hand and grab and twist the section above the base tube while pushing it toward the base tube until the tube collapses into the base tube.

7. Before collapsing any other sections, pull the vertical element wire out of the bottom of the base tube.

8. Thread the wire through the small hole in the end cap center piece and then screw the bottom end cap back onto the base tube.

9. Stay at the base tube and collapse the remaining antenna sections one-by-one by twisting and pushing them into the base tube.

   **NOTE: Be sure to keep an eye on the vertical element wire to ensure that it does not get caught in any of the collapsing sections**.

10. After all of the sections are in the base tube, push the rubber end cap into the top of the base tube.

11. Wind the vertical element wire around the two base tube tabs and you're ready to go!

# MAINTENANCE

The S9v requires little, if any, maintenance. The S9v is finished with a durable painted surface, but it is subject to oxidation – just like an aluminum antenna. If you notice oxidation (color becomes lighter), use a soft cloth and Armor All™ to restore the finish. Automotive spray wax is also an excellent product to seal and protect the finish. The S9v may also be repainted, if desired, using a quality exterior spray paint such as Krylon™ or Rustoleum™.

# SUPPORT

If you have any questions or problems installing your S9v, please contact me.

You can reach me via email at: john@s9antennas.com or feel free to call me at 469-426-8554 from 8 AM to 6 PM CST M-F. Our mailing address is:

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